A standardized FAIR data protocol to make rat brain imaging datasets more reproducible and interoperable

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Researchers at the MagLab's Advanced Magnetic Resonance Imaging and Spectroscopy (AMRIS) facility at the University of Florida's McKnight Brain Institute participated in a multi-institution study that developed methods to make rat brain imaging datasets more **Findable**, **Accessible**, **Interoperable**, and **Reusable**.

Rat brain imaging data are typically collected under a variety of conditions (e.g. different rat sex, strain, anesthesia, breathing rate, or magnetic field strength) that make it difficult to combine and compare different datasets. In this study, the authors aggregated 65 rat brain functional magnetic resonance imaging (fMRI) datasets from 45 institutions collected under a broad variety of conditions. _These data were designated as the MultiRat collection and used to develop an optimized consensus protocol and reproducible data analysis pipeline to be used by researchers for rat brain fMRI experiments_. A StandardRat collection of 21 datasets taken from the MultiRat collection was prepared based on this protocol.

By using the optimized StandardRat protocol created by the authors, researchers can ensure their datasets can be effectively reused by others. This advancement will facilitate large-scale rat neuroimaging studies across multiple institutions, greatly increasing the current and future availability of high-quality rat brain fMRI data. _The adoption of these FAIR data protocols will improve researchers' ability to study rat brain functional connectivity and to make new discoveries using datasets from a variety of prior experiments_. The authors have openly shared the datasets, consensus protocol, and reproducible data analysis pipeline in the OpenNeuro database and GitHub to maximize their value for the neuroscience community.
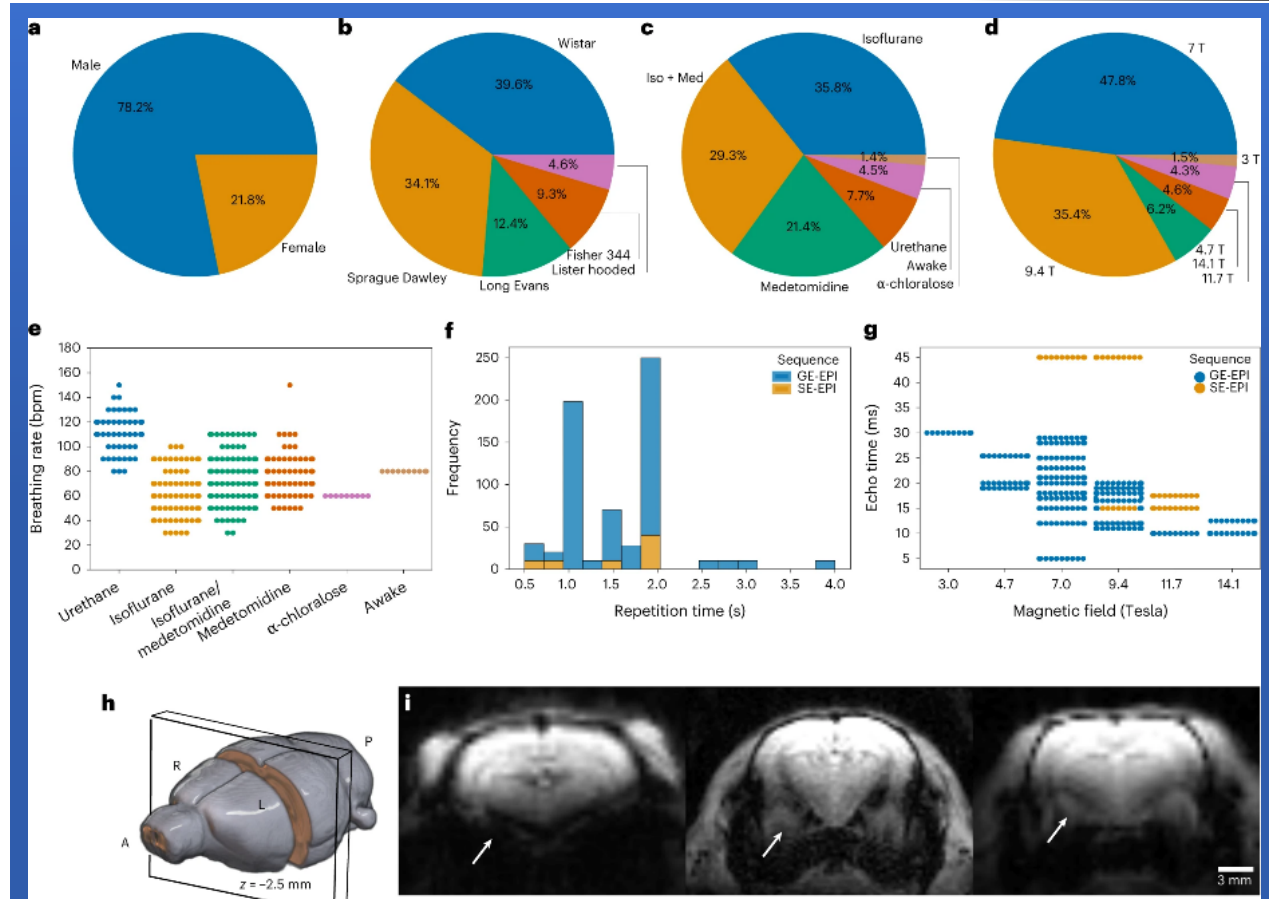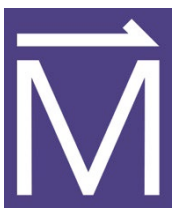

A variety of factors such as sex, strain, anesthesia, magnetic field strength, and breathing rate can affect the results of an fMRI scan. Image reprinted from original citation.

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What is the development? The MagLab's AMRIS facility, hosted at the University of Florida's McKnight Brain Institute, participated in an international collaboration that aggregated and analyzed 65 rat brain fMRI (function magnetic resonance imaging) datasets from 45 institutions. *The collaboration developed an optimized and standardized protocol to be used by researchers to store data from future rat brain imaging experiments*.

Why is this important? Rats are commonly used in pharmacological studies due to their similarities with humans in terms of drug metabolism, brain structure, and ability to learn complex tasks. However, *combining and comparing datasets from different experiments has historically been made very difficult because brain imaging data is typically collected under a variety of different conditions (for example, different rat strains, anesthesia, or imaging instrumentation). By conducting experiments with the standardized protocol created by this collaboration, researchers can ensure that their datasets are able to be reused effectively by others*. This innovation will greatly increase the pool of available high-quality data, improving researchers' ability to study rat brain connectivity and make new discoveries. The authors have openly shared all the data and the details of the protocol in open access databases to maximize their accessibility and value for the neuroscience community.

Why did they need the MagLab? The MagLab contributed a portion of the data in the MultiRat dataset that was used to develop the standardized protocol. *The authors needed to ensure that their protocol would be valid across a wide range of different magnetic resonance imaging instruments, including those with both low and high magnetic field strength. The MagLab's high mag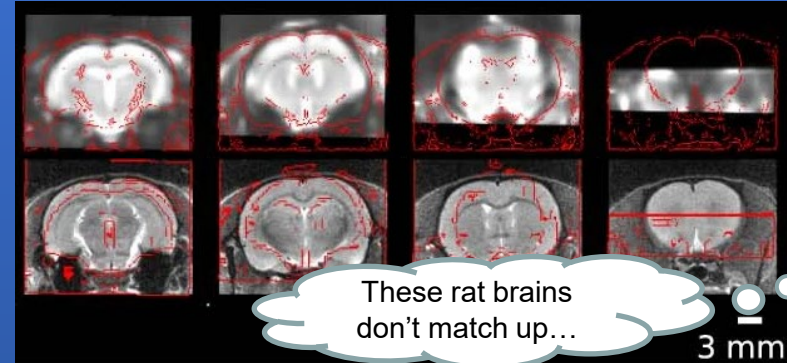netic field strength magnets were essential for this purpose*.